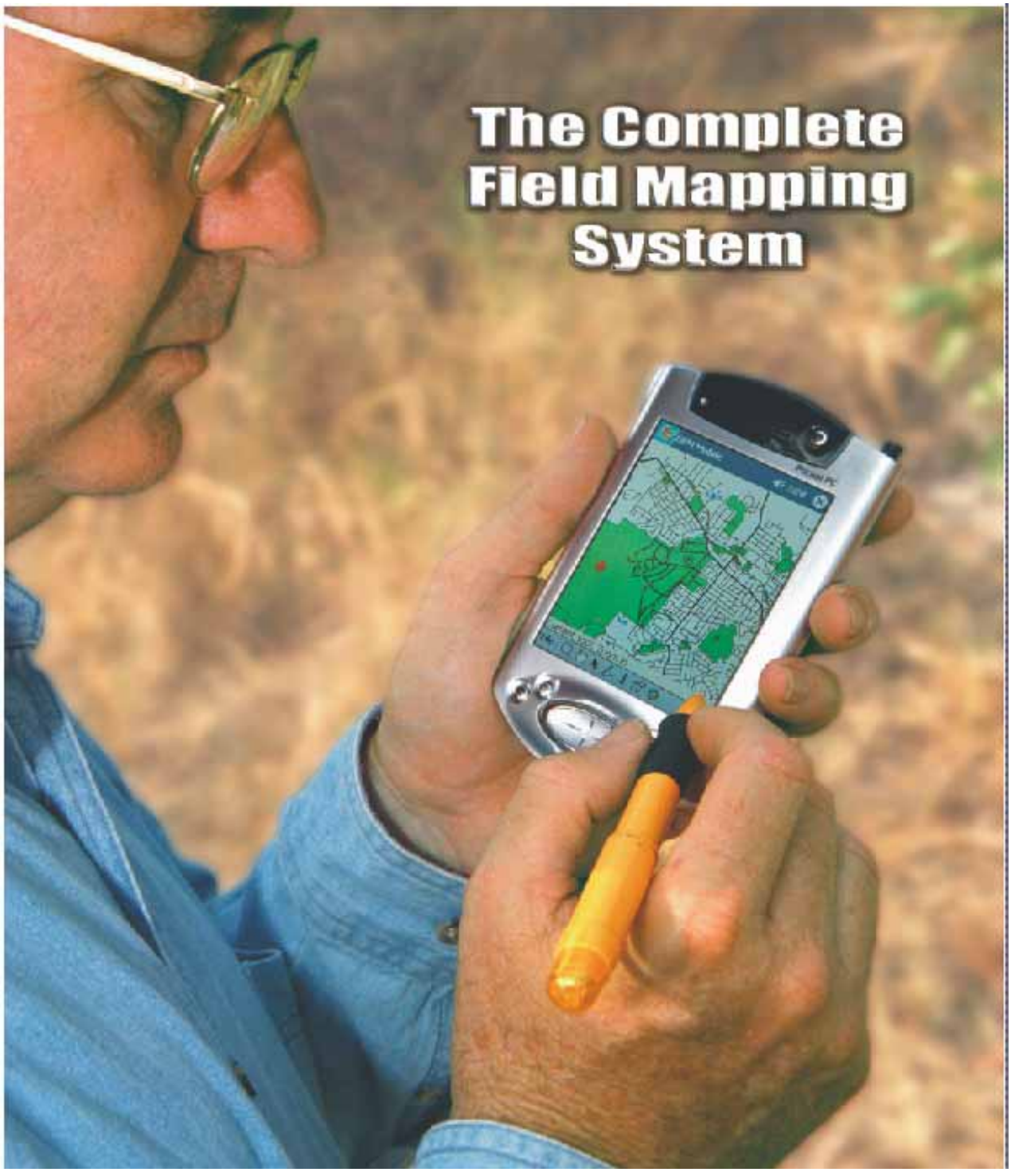
Product overview

GBm Mobile



Exa-Min Technologies

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GBM Mobile V4.10

Product Overview

July 2006

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Exa-Min Technologies

GPO Box 3202, Brisbane
QLD 4001, Australia

Ph: +61 7 32100741
Fax: +61 7 32100738
enquiries@geobasemap.com
www.geobasemap.com

What is GBM Mobile

GBM Mobile is an "out-of-the-box" solution for collecting and maintaining field data in a MapInfo environment. GBM Mobile runs on Windows Mobile Devices (PDA and PDA/Phones). It is the ideal solution for organizations that need to manage spatially distributed assets.

GIS has traditionally been an office based activity. But it is field operators who collect and maintain the underlying data, and have the greatest need for GIS services.

The recent availability of low priced and powerful mobile computers, along with the launch of GBM Mobile software, means it is now possible to service mobile workers with an "out-of-the-box" MapInfo based mapping and data solution. In the near future there are likely to be many more field workers using mobile GIS than operators of office based GIS systems.

Most mobile workers are still serviced with paper maps. Field data is recorded on paper forms for subsequent data entry. These processes are cumbersome, time consuming, error prone and expensive.

GBM Mobile provides a significantly better solution. Mobile operators have immediate access to up-to-date electronic datasets. New observations are entered and validated in the field and transferred digitally.

The following organizations are likely to have a compelling business case for using GBM Mobile.

- Any organization that currently uses MapInfo and has a mobile workforce
- Any organization that needs to locate or inspect spatially distributed assets
- Any organization with mobile operators who need information about land areas or spatially distributed assets and infrastructure

As a mobile mapping system, GBM Mobile is unique.

- It provides a complete end-to-end solution covering distribution of datasets to mobile computers (PDAs), field operations and merging field data into the central GIS database.
- Customizable data entry forms simplify field operations and manage data quality.
- The product is easily tailored through standard Windows user interfaces. No programming is required.
- The solution is fully scalable from a single mobile operator to the enterprise. Operators can synchronize data by docking to a desktop or across a wireless connection.
- GBM Mobile is a mature "out-of-the box "solution. It can be implemented quickly and used by operators with minimal computer skills and no GIS experience.

GBM Mobile delivers a comprehensive set of GIS services including viewing and editing of GIS maps based on MapInfo .tab files, GPS integration and structured data entry through Custom Forms.

Custom Forms are used to view or edit GIS attribute data and to structure the working environment for each group of field workers. Custom Forms speed data entry through the use of drop-down lists, automated calculations and data fields that are auto-populated by GIS queries or values read from connected devices such as GPS units and barcode scanners. All field data is dynamically validated at the time of entry.

These *Custom Forms* allow users to easily configure GBM Mobile as a front-end for other corporate software such as property and asset systems. It is commonly used to provide a mapping interface to data held in non-spatial database systems.

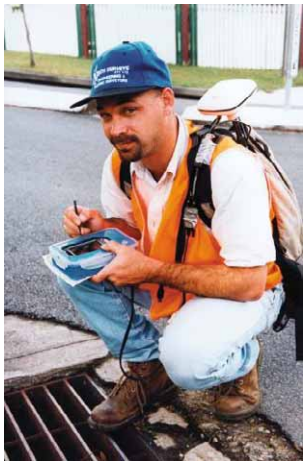
GBM Mobile is a key component of any organization's GIS strategy. It rounds out and solidifies existing corporate solutions by connecting the mobile workforce with corporate information systems. Very few corporate implementations are complete without a mobile component.

The GBM Mobile's sister product **GBM Portable** delivers similar mapping and data collection capabilities and operates on Windows XP or XP tablet computers. GBM Mobile and GBM Portable share the same Custom Forms and GPS support sub-systems.

GBM Mobile and GBM Portable systems write data directly to MapInfo format .tab file. Custom implementation are available to work with more complex data structures such as hierarchical database tables and spatial databases and to integrate with other spatial data formats.

A engineer with Cardno MBK entering condition details on a road bridge with GBM Mobile for ike. On this device, GBM Mobile interfaces directly with the inbuilt GPS, laser range finder, compass and camera..

A field officer inspecting storm water gully pit for Logan City Council



An Exploration company field site in Argentina. GBM Mobile is mounted on the motorcycle handlebars and used for general navigation and recording sample details. This photo was taken near the top of the Andes at 12,000 feet.

Why Use GBM Mobile

For the majority of organizations that use a GIS, paper based processes have, until now, been the only way that GIS data has been collected, maintained or delivered to operators outside of the office.

The irony is that GIS data traditionally lives in the office, while the assets and the people who maintain them are field based. The ability to take the GIS to the field is a revolutionary development. Its uptake has resulted from a combination of factors:

- Significant developments in PDAs over the last 18 months;
  - Processing power and memory have increased significantly
  - Screens are bigger with more resolution
  - Cost has come down
- PDAs are now accepted by management as serious corporate tools and not toys.
  - The mobile phone revolution has prepared the general public for working with digital appliances. Small and portable are now seen as highly desirable features.
- Increased public awareness of GPS and the advantages of portable map navigation.
  - This is largely driven by the advent of in car navigation systems. It means that field workers now expect to be provided with a GPS navigation system and do not resist the technology.
  - Map based web applications such as Google earth and map plug ins to telephone directories have popularized maps. Field workers are now receptive to being offered a map based interface.
- After a decade of cutting corporate costs by automating office systems, opportunities for cost savings in those areas are drying up. Managers are increasingly focusing on mobile operation as the next area for systems automation.
  - Technology and more flexible labor structures allow organizations to embrace digital appliances as a way to target mobile work force productivity.
  - Outsourcing and working from home are more acceptable. It is no longer imperative that workers check in at the office at the start and end of the work day.
  - Improvements in communications infrastructure make it feasible to provide digital data updates to field workers.
- GIS software is now available for the PDA

The mobile workforce is now ready to take on GIS, opening the way for employers to embrace the technology as a way of improving their bottom line. The GBM Mobile solution offers significant improvements on the traditional paper based processes for maintaining field data by providing for digital data collection and automated data flows.

Not only can assets be located and maintained more efficiently, but operators can go into the field more fully informed. It is now possible to take large data sets, including imagery and very accurate photography, into the field, and to interrogate this data spatially with the aid of GPS.

The business case for GBM Mobile in inevitably very easy to make and return on investment is short. The main business case drivers are improvements in operator productivity (information is immediately on hand in the field), reductions in office paperwork and data entry time (data is entered in the field), improvements in data quality (data is validated at the point of collection), and improvements in timeliness (field data is ready for immediate upload to the central database).

For example, the Queensland State Valuation Service has reported a doubling in the number of valuations their operators complete each day. By having details of dog registrations at there fingertips, animal inspectors working for Brimbank Council have significantly increased the number of infringement notices and fines each operator issues in a day.

Working with GBM Mobile

Overview

GBM Mobile is an integrated program suite for the collection and management of field data. It supports field mapping in a GIS environment and fully integrates field operations with office GIS services.

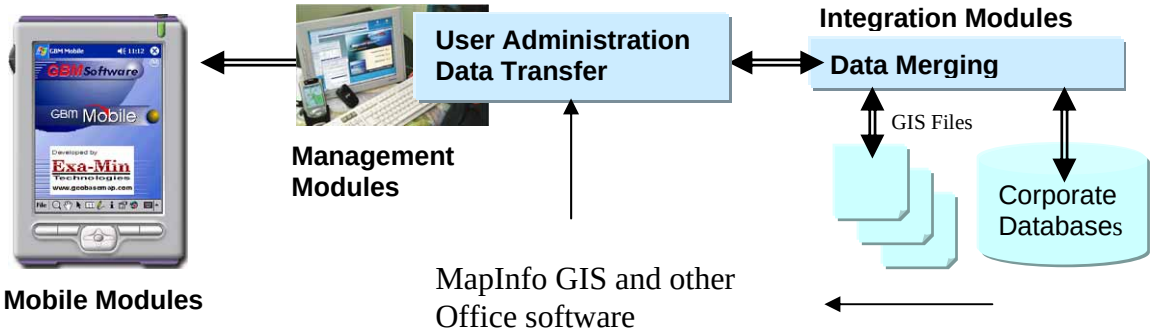
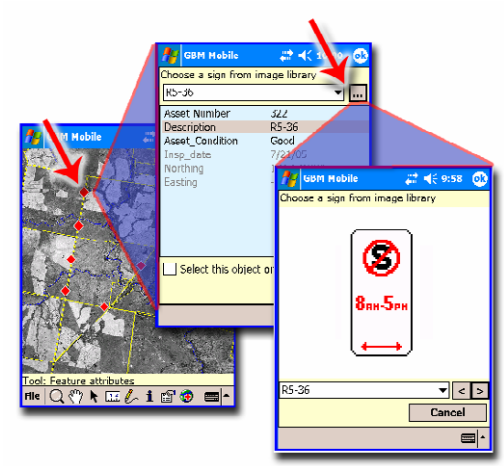


Figure 1 – A complete system

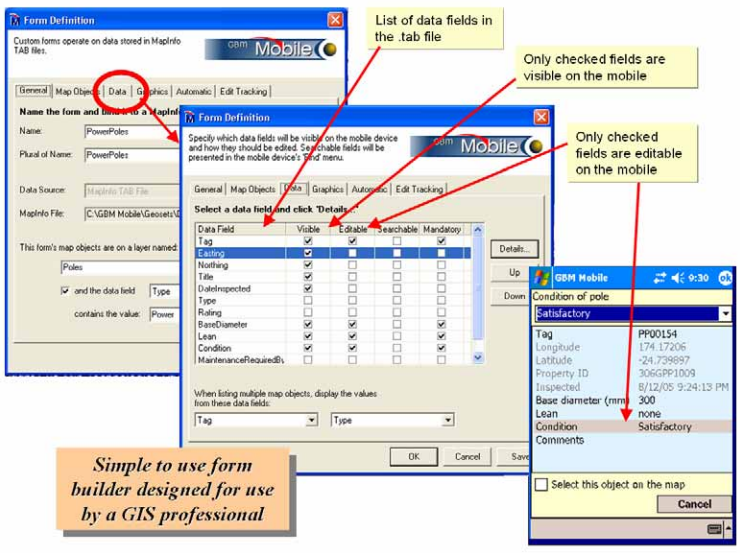


GBM Mobile is a complete solution. It automates the loading of GIS data onto the mobile device and retrieval of the edited data files, as well as merging field data into the central database. This solution is fully scalable from installation on a single mobile device to enterprise solutions involving many groups of mobile operators.

The field module runs on Windows Mobile devices (Windows Pocket PC 2003, Widows Mobile 5 and Windows Mobile phone edition) and delivers mapping services through MapInfo MapX mobile. The system delivers full GIS functionality including map display, GIS attribute interrogation and edit, feature drawing and GPS integration. Most significantly, a GIS administrator can tailor a field operator's working environment through GBM Mobile Custom Forms and Operator Profiles.

Custom Forms deliver a well structured working environment with dynamic data validation in the field, at the time of data entry.

Custom Forms control graphical drawing styles, and more importantly, control the way field workers view, collect and edit GIS attribute data. Custom forms tailor which data fields are visible to field operators, which can be edited, and how they can be searched or edited.


List of data fields in the .tab file
Only checked fields are visible on the mobile
Only checked fields are editable on the mobile
Simple to use form builder designed for use by a GIS professional

The forms interface supports drop down lists (including inter-dependent and pictorial lists), code table look ups, range checking for numeric data and auto populated data fields (e.g. calculated fields, auto-number and auto insertion of edit time, values from a map query of an underlying map layer or GPS values such as location and elevation).

An experienced MapInfo operator can easily set up custom forms. No programming expertise is required.

Edit tracking is the cornerstone of GBM Mobile data integration. For edit tracked map layers, data edits are time stamped in the field to allow the *Mobile Merge* module (operating within MapInfo Professional on the desktop) to consolidate field observations from multiple mobile devices into the central data store.

In a typical project, the data administrator (a MapInfo operator) will prepare GIS data as MapInfo .tab files using MapInfo Professional or similar product. These are composed into layered GIS Maps which are saved as MapInfo Geosets.

The local data administrator then uses the forms editor to tailor the *Custom Forms* that will control how mobile operators work with the GIS and edit GIS attributes.

The administrator also sets up an *Operator Profile* for each group of mobile operators. These profiles describe the geoset to be used by that group of field workers, the forms they require and where the data files will reside on their PDA. Operator profiles recognize the difference between working data (that is edited on the PDA) and reference data (used in background layers, and commonly held on external storage such as memory cards).

These pre-prepared *Operator Profiles* are used by *GBM Mobile Manage*r to fully automate the loading of data onto the mobile devices and retrieval of edited data at the end of each field program. *GBM Mobile Manager* greatly simplifies data installation by automatically correcting file path names as files are moved onto the mobile device. The software also includes an intelligent data transfer mechanism that refreshes data files only when necessary. With GBM Mobile, these normally complex operations can easily be carried out by field operators with a low level of computing expertise.

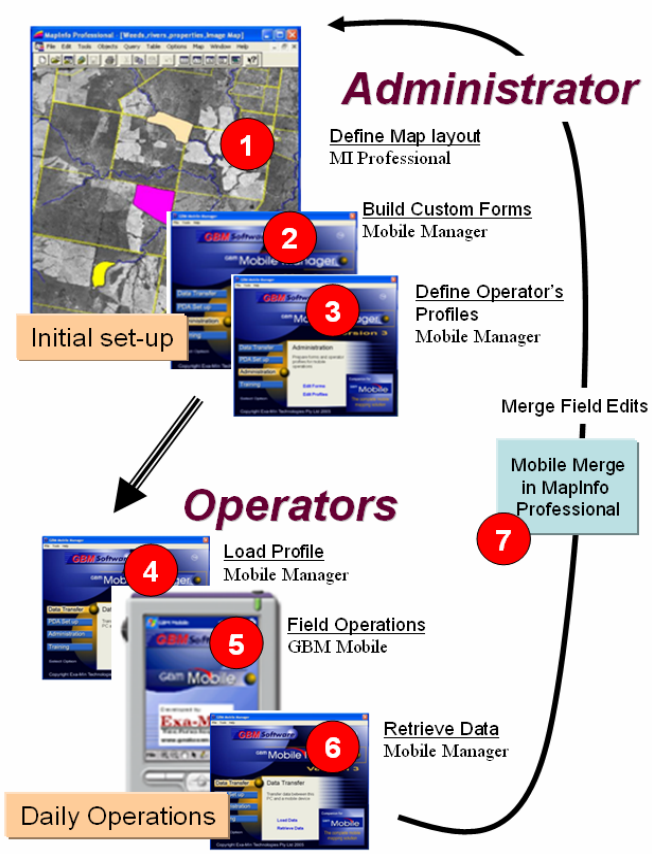
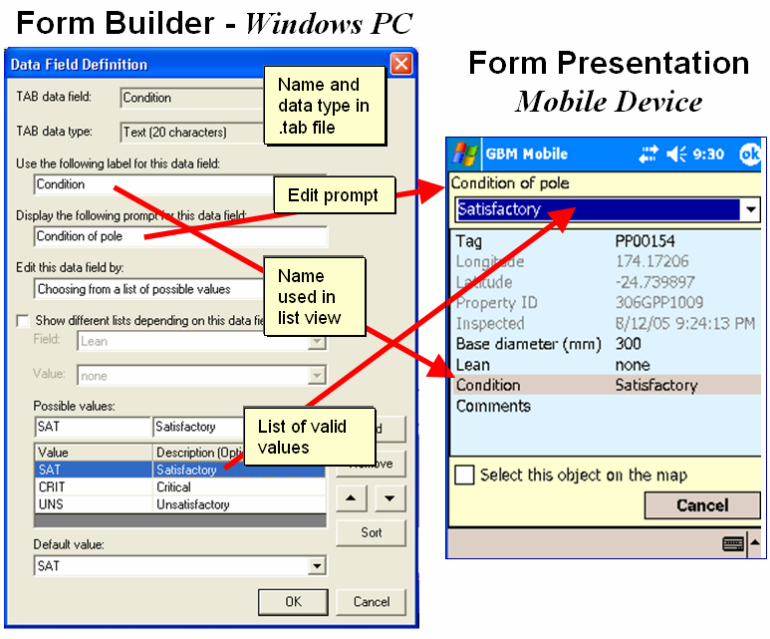


Figure 2 - Processing Flow



Mobile operators create and edit GIS data through the custom forms. New GIS features may be created by drawing on the screen with a stylus, from GPS input, or using the geometry of an existing map object. Attributes may be entered manually, inherited from a selected map object or auto-populated with the result of GIS queries or with systems information.

Typically a user will click on an existing map feature to edit its attributes, or select a custom drawing tool to invoke the required drawing mode. The relevant custom form pops up automatically once drawing has been completed.

For example, a user may choose to create a Power Pole through a custom form that automatically sets the feature type and graphical style (color and symbol), auto-populates selected data fields by GIS query on underlying map layers and present drop down lists for the user to specify values for other attributes.

GIS data and custom form set-up is normally carried out by a project data administrator on a Windows desktop. User administration and day-to-day operations such as loading and retrieving field data can be invoked from Windows workstations or via web transfer.

Implementation Options

Users may choose to interface GBM Mobile with their office network through any of three support systems. The choice of operating environment is usually dictated by the user's scale of operations, work practices and requirements for integration with third party applications other than MapInfo.

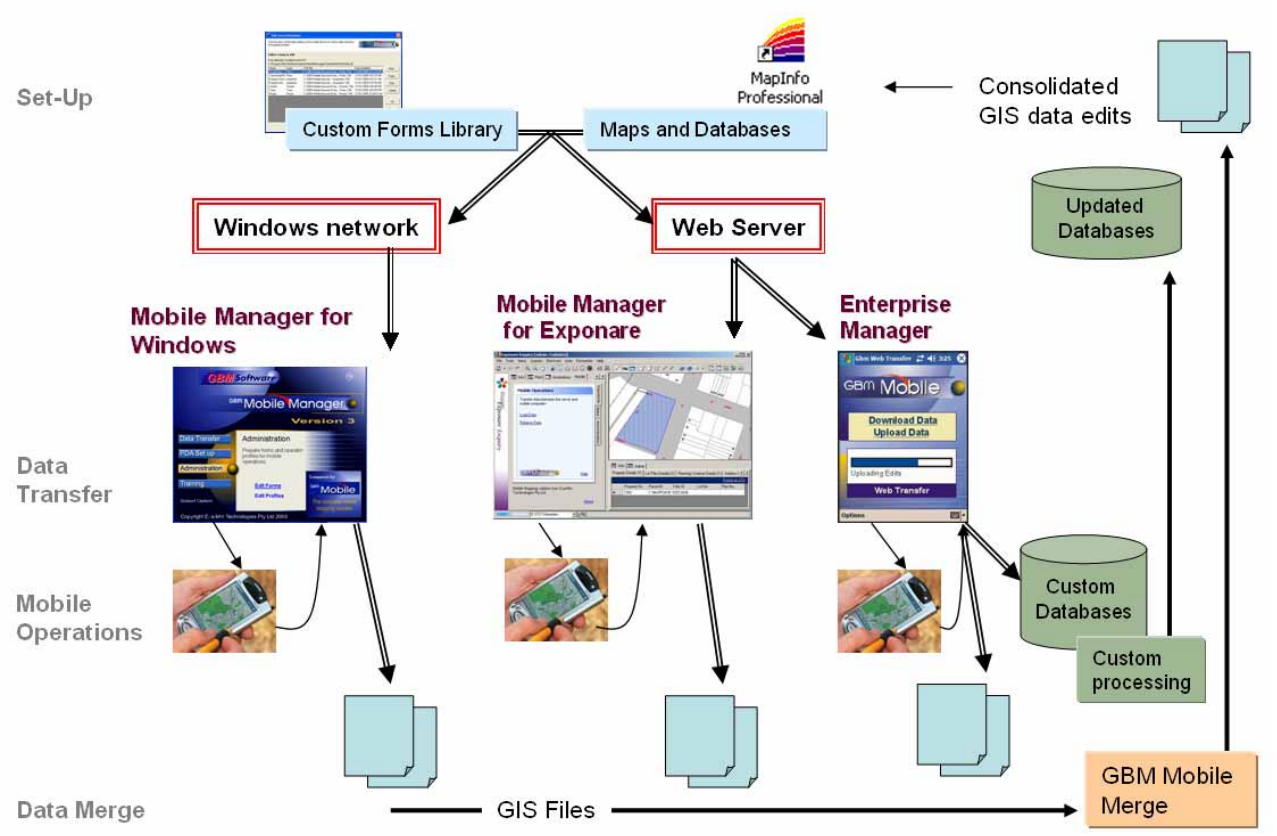


Figure 3 - Implementation Options

GBM Mobile Manager for Windows

This is the recommended entry level. The support software is installed on a Windows workstation and PDAs are docked to the PC via USB cable. This management software transfers data between the PDA and the local hard drive or networked file system.

Custom Forms, Operator Profiles and GIS data are stored as windows files on the local network. GBM Mobile Manager for Windows, operating on one or more computers may share common upload and download folders on a local network.

This solution is ideal for small work groups and is commonly installed in operations involving between one and 25 mobile operators.

GBM Mobile Manager for Windows is included with each GBM Mobile license. Apart from the regular GBM Mobile license required for each PDA, no additional licensing is required.

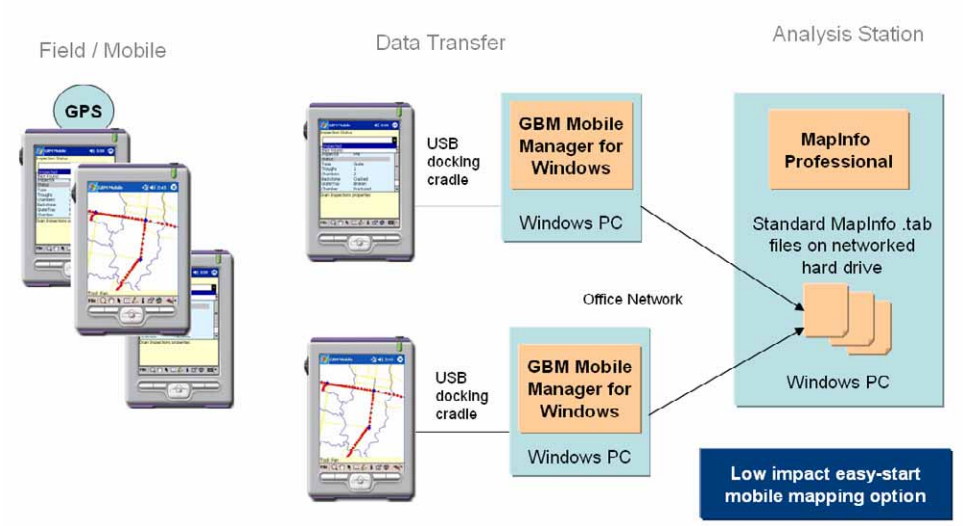
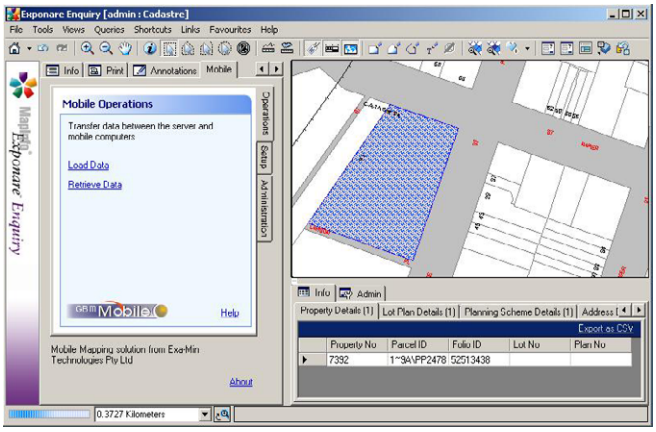


Figure 4 – Installations of GBM Mobile Manager for Windows accessing common data folders on a network.

GBM Mobile Manager for Exponare

This product operates as a Microsoft .NET client communicating via web services with the server components.



This solution provides similar functionality to GBM Mobile Manager for Windows, but presents on a dialog tab within MapInfo Exponare.

This solution supports a more centralized data management philosophy as remote users download and upload data between the mobile device and a central server rather than a local PC, even though the PDA is docked to a client PC running MapInfo Exponare. A further advantage is that access to mobile services is managed through the Exponare administrator.

Custom forms, Operator Profiles and GIS data resides on the central server. Licensing for GBM Mobile Manager for Exponare is additional to the regular GBM Mobile licenses required for each PDA. It requires MapInfo Exponare.

GBM Enterprise Manager

This product provides all the functionality of GBM Mobile Manager for Exponare but may be installed separately from Exponare.

The PDA may be docked by USB cable to a windows workstation running MapInfo Exponare or running the separate GBM Enterprise Manager client. GBM Enterprise Manager can also be run directly from a PDA, without docking it to a windows workstation, and is commonly used with PDAs that are connected to the internet via a wireless LAN or mobile phone.

The Enterprise solution is especially relevant in situations where field personnel work remotely from the office and do not have ready access to a networked PC. It is also the preferred solution for customers who require custom interfacing with certain third party databases.

Custom Forms, Operator Profiles and GIS data resides on the central server.

The GBM Enterprise Manager is licensed on a per server basis. Licensing is additional to the regular GBM Mobile licenses required for each PDA. MapInfo Exponare is not required, but GBM Enterprise Manager will run within MapInfo Exponare if that product is installed.

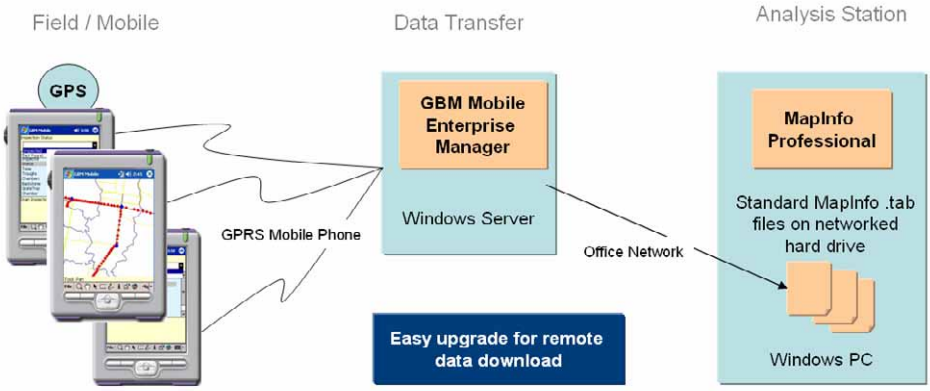


Figure 5 - PDA units exchanging data wirelessly with the Enterprise Manager.

Project roll-out

Most customers commence with a simple implementation based around *GBM Mobile* on the PDA and *GBM Mobile Manger for Windows* on one or more support PCs. These systems work with MapInfo .tab GIS files. Data merging is carried out with GBM Mobile Merge operating within MapInfo Professional.

Only those users who want to transfer data across the internet, without an intermediate PC system, or customers with very specific data integration requirement (see below), need to upgrade to the *GBM Enterprise Manager*.

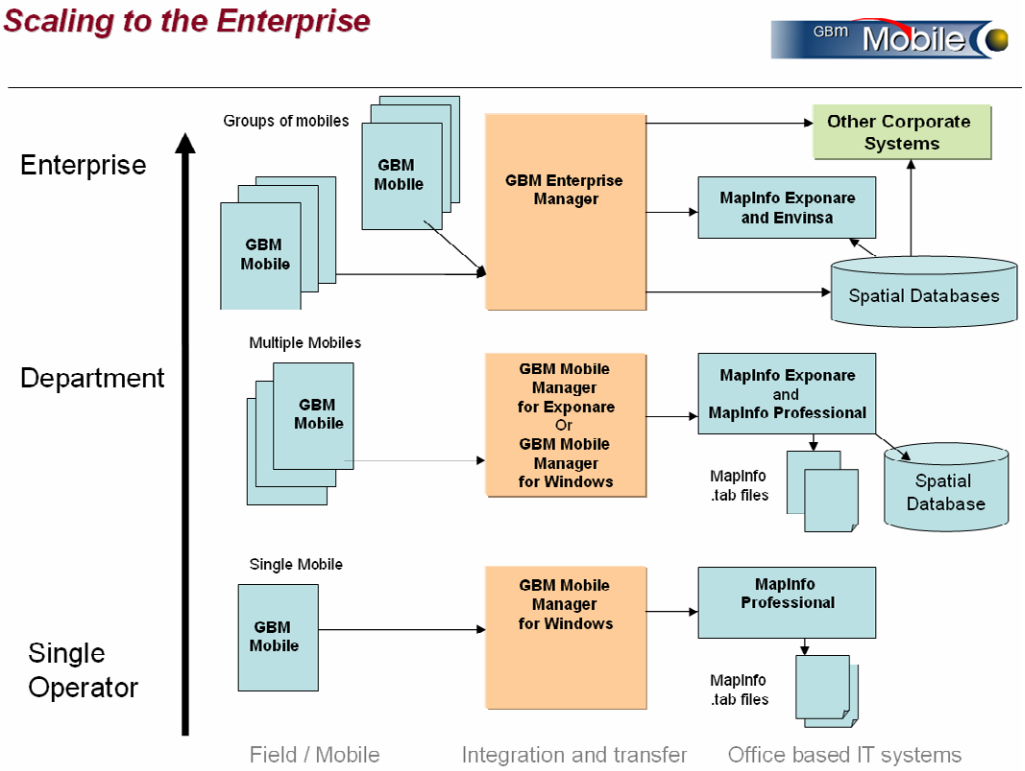


Figure 6 - Matching the support systems to the scale of a mobile mapping implementation.

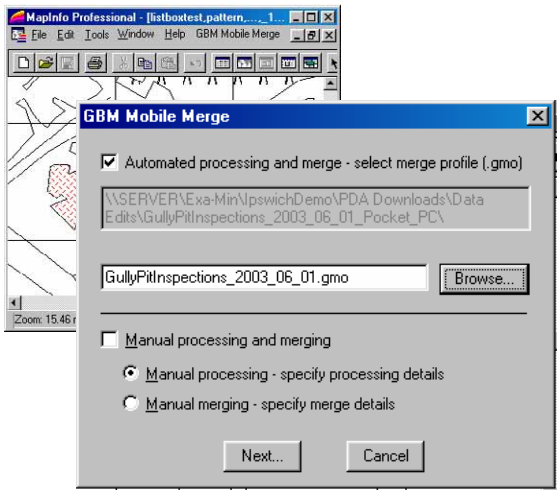
Data Integration

In most projects, it is not enough to simply collect the data. The job is not finished until the central database is updated with the new field observations.

The GBM Mobile suite includes office based systems to automate these merging processes.

MapInfo data sets

Where the primary data set is in MapInfo tables, data merging is automated through *GBM Mobile Merge* and the *Edit Tracking* option of *GBM Mobile*.



When Edit tracking is invoked, GBM Mobile time stamps all data edits carried out in the field and tags changed records. A merge profile is created when the data is retrieved onto the PC, and is used by GBM Mobil Merge to log subsequent processing and automate the integration of the field data into the master data set.

GBM Mobile Merge operates within MapInfo Professional on the support PC. The software first processes the downloaded data to separate out those records that have been edited and opens a separate layer for each type of edit (a separate layer is created for new records, deleted records, records with spatial objects edited, records with attributes changed, records with attributes and spatial objects changed).

The GIS supervisor then has the opportunity to review the changes made by each operator. The supervisor may reject some proposed edits or simply accept all changes and have them integrated into the master copy of the data.

Merging uses edit time to resolve concurrent edits. It is quite practical to have several operators working with the same GIS data files at the same time and rely on Mobile Merge to consolidate the changes.

Where the master data set is in linked tables on the PC (spatial objects residing in MapInfo files linked to attributes that are stored in a separate database), attribute edits are automatically committed to the external databases.

Advanced integration options

GBM Mobile can be integrated with applications other than MapInfo through custom interfaces that take account of customer specific business processes and database structures.

In most custom integrations, data is transferred between the office systems and the PDA via the GBM Enterprise Manager. This software provides an integration framework that allows external developers to fuse the custom extensions that communicate directly with the external processes or data sources.

Integration is most easily implemented via a staging database. Typically a locally developed application will lodge work instructions into the staging database, and retrieve completed work from the database. The GBM Enterprise Manager then handles the distribution of the work to mobile devices and retrieval of completed work packages.

In other implementations, the custom application interfaces directly with GBM Mobile on the PDA.

Seamless integration of this mobile solution with a server database can require a small amount of project specific customization. In particular, it may be necessary to code the business rules that govern access to external application databases.

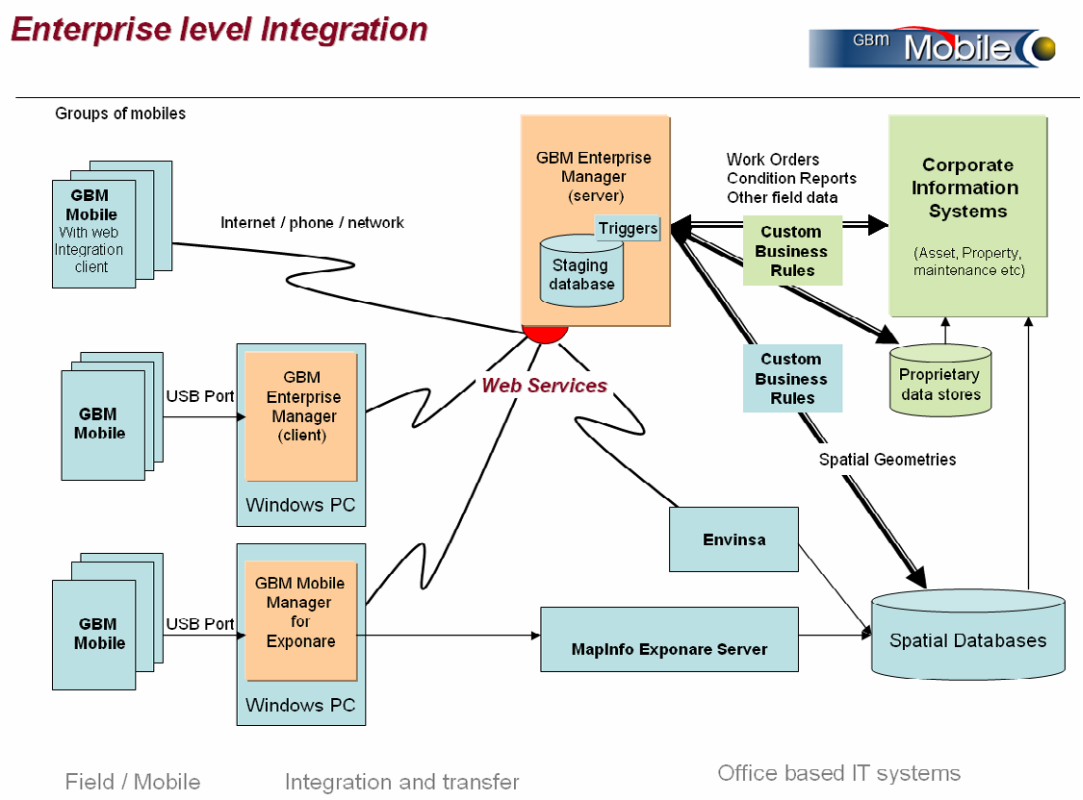


Figure 7 – Enterprise level integration

PDA components of the GBM Mobile solution also support linking of hierarchical databases with GIS files. For example, it is possible to build mobile implementations with multiple inspection records linked to a single spatially located asset (see below).

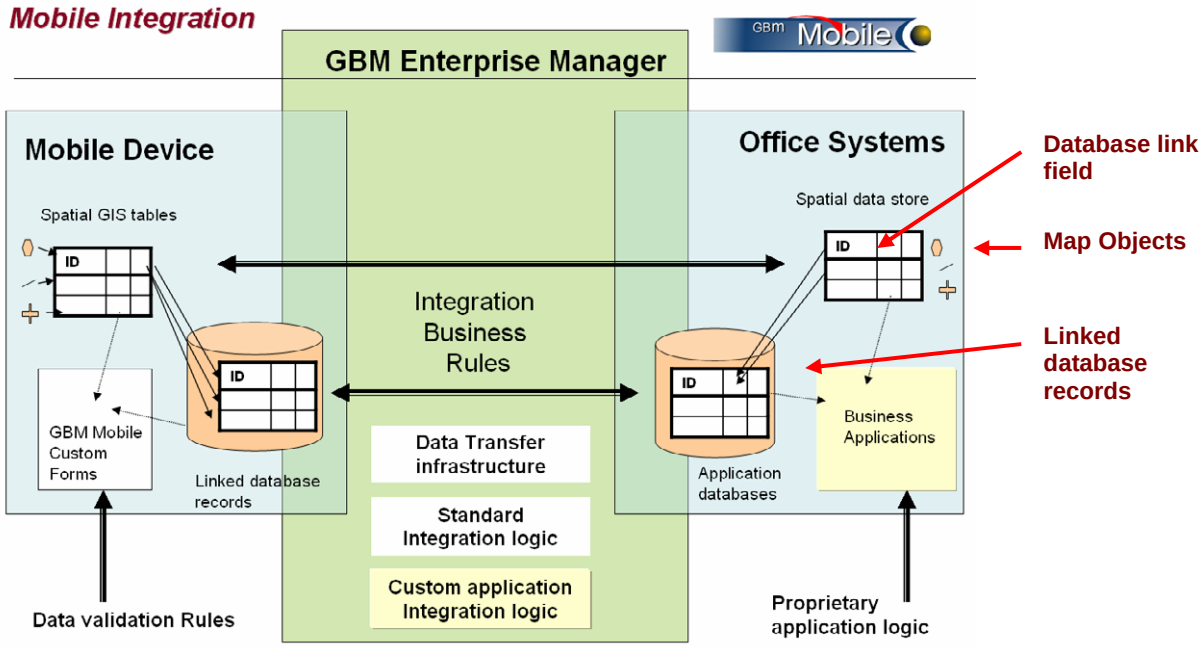


Figure 8 – Advanced data binding

While custom integration solutions provide a very efficient working environment for larger and well defined projects, they are used by only a very small proportion of existing customers. The vast majority of GBM Mobile customers merge field data into MapInfo .tab files (stand alone files or database linked tables) using the “out-of-the-box” features of *GBM Mobile Merge*.

GBM Mobile Features

Fully featured GIS

- View maps with vector and raster layers from MapInfo .tab files
- Zoom and Pan
- Draw and edit points, lines, regions and text
- Create new map objects using existing geometries
- Vertex edit
- Layer control
- Assign graphical styles with full MapInfo symbology
- Info, statistics and measure tools
- Data search with map highlighting
- Validate regions

Custom Forms

- Structure work processes with custom forms
- Create and edit forms through simple user interfaces
- Standardize graphical styles and update graphics on data edit
- Define data fields as visible, editable, searchable or mandatory
- Present pick lists, pictorial pick lists and calendars for data entry
- Manage and validate the entry of text and numbers
- Track changes and time stamp edits
- Auto-populate fields with results from spatial queries, GPS data or system information
- Camera integration

GPS enabled

- Use any GPS outputting standard NMEA format data
- Connect via CF Card, Bluetooth, cable or internal GPS chip
- Auto-detect connection and communication parameters
- Moving map display
- Draw points, lines or regions from GPS input
- Time based averaging to improve GPS fix
- Way point navigation
- GPS tracking and distance alerts
- GPS locations transmitted to the server via mobile phone (used in association with the GBM Tracking extension and client specific customization)
- GPS post-processing and integration with laser distance measurement equipment with the optional GBM Survey Tools extension

Data transfer

- User Profiles fully describe the GIS data, forms and hardware set-up for each operator group
- Load a User Profile to the PDA with a single button click
- Retrieve and process edits with a single button click
- Dock PDA to a support PC or transfer data across the web
- View a log listing a history of data transfers to each PDA

Comprehensive Data Management

- Time stamping and tagging of field edits
- Audit trail for downloads and data edits
- Automated merging of field edits into the primary datasets
- Supports multiple field operators and concurrent editing
- Resolution of concurrent edits

Latest Technology

- Supports high resolution and landscape format screens
- Data transfer via mobile phone and web services protocols
- Works with bar code scanners

Ergonomic Operation

- Map any menu item to a hardware button
- Tool bar and form layouts optimized for the PDA screen layout

Complete Out-of-the-box Solution

- No programming needed
- Fully integrated suite of PDA software and support systems
- Data preparation and data merging tools for MapInfo Professional
- Automated data transfer through windows or web interfaces

Mature and Robust

- Version 3.5 product with three years production experience around the globe
- Supports international numeric and date formats
- Fully documented with user manual, help files and animated tutorials

Key Advantages

Integrated Solution

GBM Mobile integrates PC and mobile operations. It manages concurrent data edits from multiple field operators so that central databases can be reliably updated with new field observations.

Full Feature Set

All releases incorporate the full GIS toolbox and integrate with GPS receivers.

Simplicity of Operation

Clear, intuitive screen layouts and easily customized data forms minimize training overheads.

Consistent Maps

Map feature are always drawn with the right map symbols. Graphics change automatically when attributes are updated.

Quality and Reliability

GBM Mobile is based on Exa-Min's ten years of experience in delivering shrink-wrap mapping solutions to the MapInfo community. The product has the reliability and finish needed for mission critical operation.

Operator Productivity

Custom forms streamline field data entry. Tool button and screen layouts are optimized for operator productivity.

Maturity and Flexibility

This is a flexible third generation product built on an extensive background of field testing and customer feedback. It is easily adapted to almost any field environment.

Enterprise Enabled

Fully scalable from a single PDA to the enterprise. Supported by optional web server and data integration tools.

GBM Mobile Licensing

GBM Mobile is licensed on a per PDA basis. Each PDA license entitles the customer to install and operate GBM Mobile on a single PDA and run GBM Mobile Manager on a Windows PC to support mobile operations. Customers are also licensed to operate the Mobile Merge modules within MapInfo Professional.

Customers who have an evaluation CD may run the above software free of charge for 30 days under an evaluation license. Contact Exa-Min or your local GBM Mobile reseller to convert an evaluation system into a commercial license. A list of GBM Mobile resellers is available on the Exa-Min web site at www.geobasemap.com.

Licensing for MapInfo Professional is not included as part of GBM Mobile suite, although it is likely that the administrator for each group of mobile users will need access to MapInfo Professional or similar product to establish the GIS data.

GBM Mobile Manager for Exponare and the *GBM Enterprise Manager* are licensed on a per server CPU basis. Server licensing is additional to the GBM Mobile license required for each PDA. Typically a large number of mobile operators will access the one server.

GBM Enterprise Manager customers are entitled to use GBM Mobile Manager for Exponare at no additional charge, but need to make separate arrangements for Exponare licensing.

Hardware for GBM Mobile

Mobile Devices

Mobile components of GBM Mobile V4.10 are based on MapInfo's MapX Mobile 5.05 SDK and programmed with C++ and Microsoft .NET. Windows and server components are developed with Microsoft Visual Basic and Microsoft .NET.

Mobile software will operate on Windows Mobile hardware supporting MapInfo MapX Mobile V5.05. This means a PDA with Widows Pocket PC 2003 running on an ARM compatible processor. Most modern Windows mobile devices including Pocket PC 2003, Windows Mobile 2003 and Pocket PC 2003 Phone Edition devices use Intel XScale processors that satisfy these requirements.

Suitable mobile devices are available from HP (iPAQ), Del (Axim), Trimble (GeoXT/XM/Recon), TDS, SurveyLab (ike), Symbol, Intermec, O2 (XDA), Imate, ike, Archer and many other manufactures.

Customers who require a system with the features of GBM Mobile, but need to run on notebook and tablet computers, should contact Exa-Min for information on the GBM Portable product.

Mobile Manager

GBM Mobile Manager is best installed on Windows XP or Windows 2000 workstations.

Server systems

Server components (included with GBM Mobile Manager for Exponare and the GBM Enterprise Manager) are normally installed on a Windows server platform. Systems requirements are similar to those for the MapInfo Exponare server.

GPS Units

GBM Mobile will connect to any GPS that is able to transmit data in the industry standard NMEA format. Almost all modern GPS units can supply NMEA output. GBM Mobile (with the optional Survey Tools extension) can also select proprietary format data from selected manufactures.

GPS units can be mounted on a CF card, connected via cable or communicate with the PDA wirelessly via Bluetooth.

The accuracy of the GPS fix is determined by the GPS unit rather than GBM Mobile.

Stand alone (autonomous) GPS units generally achieve an accuracy of between ± 5 meters and ± 20m. The units deliver higher accuracy if used in conjunction with a Wide Area Augmentation System (WAAS). WASS is generally available in North America and can be obtained on a subscription service in other parts of the globe.

Greater accuracy (around ± 1m down to decimeter or better) can be achieved by Differential GPS receivers communicating with a local base station. The gain their improved accuracy by processing signal correction data, received in real time from accurately located base stations.

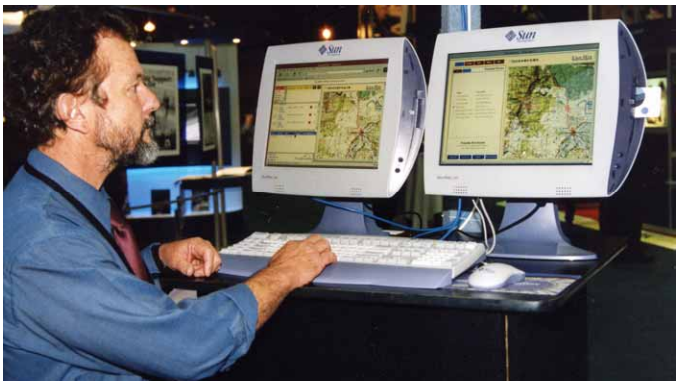
Sub-meter accuracy is also available by post processing signal data back in the office. The optional GBM Survey Tools extension adds GPS post processing support to GBM Mobile for selected GPS hardware manufacturers.

GPS units range in price from less than $200 to tens of thousands of dollars depending on accuracy and differential correction capabilities.

A common misconception is that high accuracy GPS units are needed by all field operators. In reality, over 90% of existing GBM Mobile customers are operating successfully with low priced (lesser accuracy) GPS hardware. While higher accuracy is desirable for initial data capture, such as marking the installed location for buried assets (cables and pipes), much lower accuracy (and cheaper) GPS units are often suitable for subsequent re-location of those assets.

In contrast to traditional hand-held GPS receivers, GBM Mobile presents a map that shows the location of the asset of interest relative to visible landmarks or better still, presents the asset location relative to high resolution aerial photographs or satellite images. Assets can be located with high relative accuracy (offset relative to visible landmarks), while the GPS unit needs only sufficient resolution to help the operator to navigate to those landmarks.

Contact Details



GBM Mobile is developed by Exa-Min Technologies Pty Ltd. Exa-Min is a GIS consultant and software developer based in Brisbane Australia. The company has been in business for fourteen years and is a MapInfo Strategic Partner.

Key developer credentials include:

- Developer of MapInfo Professional add-on products under the GeoBasemap banner that have been assisting MapInfo users for the past ten years to better manage their GIS data.
- Developer of stand-alone, off-the-shelf, GIS based products under the GBM Software banner that have encouraged and enabled the broader deployment of GIS within organizations.
- Provider of custom software solutions, including mapping and database applications leveraging off the full range of MapInfo platforms
- Corporate GIS deployment specialist with web and high-end spatial database expertise
- Specialist in the integration of corporate systems with electronic maps
- A large customer base spanning the Land Administration, Defense, Mining, Agriculture, Telecommunications and Environment sectors.

Exa-Min's major development focus is on mobile mapping and the integration of data captured in the field with central corporate systems. We aim to be the pre-eminent supplier of mobile mapping solutions to the ever-expanding customer base utilizing spatially located data.

Exa-Min products are supported by an international reseller network. Exa-Min resellers are application specialists who provide our customers with training, consulting and implementation assistance. A reseller list is available on the Exa-Min web site at www.geobasemap.com.

Exa-Min Technologies
GPO Box 3202, Brisbane
QLD 4001, Australia

Level 2, 143 Charlotte Street
Brisbane Q 4000, Australia

Supplied by:
Johnny Appleseed GPS
Ph 07 3717 8555

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